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A Measurement of the Ambient Radon Rate and MeV-Scale Calorimetry in the MicroBooNE LArTPC

Many physics goals of future large LAr detectors like DUNE hinge on the achievement of high radio-purity to minimize backgrounds to low-energy signals like supernova and solar neutrinos. Radon in particular is a concerning source of backgrounds, as its progeny generate diffuse signals from betas, gammas, and neutrons at the MeV-scale. In this talk, we report measured limits on the specific activity of Rn222 in the bulk LAr of the MicroBooNE neutrino detector at Fermilab during standard data-taking periods. This measurement, achieved with newly developed low-energy LArTPC reconstruction and analysis techniques, is the first of its kind for a noble element detector incorporating liquid-phase purification. We also demonstrate the calorimetric capabilities of single-phase LArTPC technology at the ~MeV and sub-MeV scale with reconstructed energy spectra of betas and alphas from tagged isotope decays.

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